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May 29, 2013

Arizona Corporation Commission
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AZ CORP COMMISSION
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Docket E-00000C-11-0328 Smart Meters

To Whom It May Concern:

This filing for the Smart meter docket #E-00000C-11-0328 contains an original filing plus 13 copies and is being filed on behalf of the Safer Utilities Network.

Sincerely,

Frank R. Mead
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Attorneys for Safer Utilities Network

Enl.: Certificate of Service

Arizona Corporation Commission
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Certificate of Service

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OPEN MEETING AGENDA ITEM

May 24, 2013

Arizona Corporation Commission
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AZ CORP COMMISSION
DOCKET CONTROL

Docket # E-00000C-11-0328

BEFORE THE ARIZONA CORPORATION COMMISSION

What epidemiological studies reveal about health effects from wireless smart meters

Television and cell towers are similar to wireless smart meters in a number of important ways: They transmit radio waves (RF) on similar frequencies, they transmit day and night, and the human exposure levels are comparable.

Transmitters on towers are more powerful than wireless smart meters, but they are also much further away. The radiation exposure diminishes rapidly with distance.

A smart meter will often be three to ten feet away from where people sleep. A cell tower is rarely closer than a few hundred feet, and is often further away.

Television transmitters are generally on very tall towers and cover a large area.

Radiation levels can be measured with instruments. As we shall see, the radiation levels that humans are routinely exposed to from smart meters have been found harmful when coming from cell towers and television transmitters.

Smart meters transmit on frequencies around 900 megahertz and sometimes also 2400 megahertz. The studies presented here all involve transmitters using similar frequencies.

The radiation units

Various units are used to specify the radio-frequency radiation levels. Some of them look very similar ($\mu\text{W}/\text{cm}^2$, mW/cm^2 , $\mu\text{W}/\text{m}^2$, etc). The reports cited in this document use a variety of units. To make it simple to compare numbers, we use one single unit throughout this document: $\mu\text{W}/\text{cm}^2$. It is pronounced microwatt-per-square centimeter.

When inspecting the source material, it is important to know these conversion factors:

$$1 \text{ mW/cm}^2 = 1000 \text{ } \mu\text{W/cm}^2$$

$$1 \text{ } \mu\text{W/cm}^2 = 10000 \text{ } \mu\text{W/m}^2$$

$$1 \text{ mW/m}^2 = 1000 \text{ } \mu\text{W/m}^2$$

The radiation from a smart meter

The electric utility industry has a research institute: Electric Power Research Institute, EPRI. EPRI has published a report showing how much one particular smart meter radiates under normal circumstances.

According to EPRI, the average radiation levels of their sample meter are¹

0.1 $\mu\text{W/cm}^2$	¼ watt transmitter 1% duty cycle 3 ft distance
2.0 $\mu\text{W/cm}^2$	1 watt transmitter 5% duty cycle 3 ft distance
0.2 $\mu\text{W/cm}^2$	1 watt transmitter 5% duty cycle 10 ft distance

Many people will spend much time at a distance of three feet from a smart meter. Some have their bed or a desk up against the wall, with a smart meter on the outside. Many more will be within the ten-foot range, which encompasses a full room of common size.

Real-world radiation levels may be much higher than these levels reported by EPRI.

¹ *Radio-Frequency Exposure Levels from Smart Meters: A case study of one model*, EPRI, February 2011. See Table 1.
www.epri.com

If the inside room is a kitchen with a steel countertop, refrigerator or other metallic surfaces, these can act as reflectors, just as a mirror reflects the sun. A person receiving direct and reflected radiation can be exposed to much higher levels.²

The EPRI sample meters only transmit 1% or 5% of the time. In some cases, a smart meter can transmit nearly continuously, which produces a higher radiation load. Mesh smart meters pass on messages from other meters, and can be particularly busy. According to court-ordered disclosures, a mesh smart meter can transmit as often as 190,000 times a day.³

Wireless computer networks are being tested, which use mesh smart meters to transfer computer signals, in addition to the smart meter data. This may increase the number of transmissions by orders of magnitude. With such increased duty cycles, the radiation increases as well.

Single-family dwellings will have one smart meter, while most multi-unit buildings will have one for each apartment or condominium. These are usually clustered. One apartment or condo can have a dozen or more smart meters on the wall. The radiation will increase with the number of meters.

The EPRI radiation numbers are thus a baseline for a typical situation. Some people will see significantly higher exposure levels.

Epidemiological studies

An epidemiological study is an investigation of health effects on real people over time. It does not take place in a laboratory, but in the real world.

The scientist must make sure to minimize outside influences, especially from other sources of radiation. Some studies therefore use small towns or data from before cell towers became common. Newer studies sometimes use dosimeters to measure the actual radiation level for each person.

Epidemiological studies take a lot of effort to do well, as many people and much data is involved. Therefore, few are done. We present six here.

The executive summary of the first study is included at the end of this filing. The abstracts of the others are included as well.

² *Assessment of Radiofrequency Microwave Radiation Emissions from Smart Meters*, Sage Associates, 2011.

³ *How often wireless smart meters actually transmit*, ACC Docket E-00000C-11-0328, April 30, 2012.

The Styrian study

The Provincial Public Health Department of Styria, Austria, conducted a study in the small town of Vasoldsberg/Hausmannstaetten. A small cell phone tower had been operating in the area for 13 years, and was being replaced.

This study is a case-control study (162 cases/1944 controls) to investigate long-term health effects from the old tower.

The old tower had a transmitter input of 25 watts; the actual output effect was not specified, but will be less.

People in Germany tend to live much longer in the same house than Americans do, so it is easier to do epidemiological studies there.

The cases of cancer in the preceding years were identified, and the location of their homes was mapped relative to the exposure levels from the cell tower.

The study found a clear correlation. People living within the highest exposure category were 23 times more likely to contract breast cancer and 121 times more likely to get a brain tumor, than the control group.

The lowest radiation category was less than $0.001 \mu\text{W}/\text{cm}^2$. The highest category was $0.1 \mu\text{W}/\text{cm}^2$ or higher. We remind the reader that smart meters expose many people to radiation around $0.1\text{--}2 \mu\text{W}/\text{cm}^2$, sometimes higher.

Source:

Environmental Epidemiological Study of Cancer Incidence in the Municipalities of Hausmannstatten & Vasoldsberg (Austria), Dr. Gerd Oberfeld, Commissioned by the Provincial Government of Styria, January 2008.

The executive summary of this report is included as an appendix at the end of this filing.

The Rimbach study

When a cell phone mast was erected in the small town of Rimbach, Germany, researchers measured the neurotransmitters in the urine of sixty townspeople. The urine was collected before the transmitter was turned on, and three times after.

The effects on adrenalin, noradrenalin, dopamine and phenylethylamine were dramatic: after six months, the stress hormones adrenalin and noradrenalin were highly elevated, while dopamine was depressed. These mostly recovered after 18 months, as the townspeople's bodies adjusted to the radiation. But they did not return to prior levels, and some people did not recover.

The neurotransmitter phenylethylamine (PEA) changed differently. At six months, it was elevated, but at 18 months it was on average down 50% from the original pre-tower level.

PEA is important in psychological illnesses. People suffering from depression and children with ADD/ADHD all tend to have low levels of PEA. The increasing prevalence of these disorders may be due to the rising levels of microwave radiation in society.

The townspeople were divided into three groups, depending on the radiation level at their home. The high-exposure group was those living with radiation levels above $0.1 \mu\text{W}/\text{cm}^2$. The middle group had exposures between 0.06 and $0.1 \mu\text{W}/\text{cm}^2$, with the low-exposure group below $0.06 \mu\text{W}/\text{cm}^2$.

Note that these exposure values are peak levels, not averages as used in all other studies, and used by EPRI. Had the averages been used, the above numbers would be lower. The peak method was used as it provides a more correct reading of this type of pulsed radiation.

We remind the reader that data provided by the EPRI Institute indicates that many people with a smart meter will be exposed to radiation levels of 0.1 – $2 \mu\text{W}/\text{cm}^2$ averaged (not peak). This puts these people solidly in the same category as the Rimbach "high exposure" group.

The Rimbach study found a clear correlation between the exposure level and the changes in the four neurotransmitters. The people in the high-exposure group were the most affected, the people in the low-exposure group, the least.

The report points out that there was great variation in how much individuals were affected, even within the same exposure group. Some people were objectively more sensitive to the radiation. They noted that children and people with health conditions, especially allergies, tended to be more affected.

It was also discovered that people who had other wireless devices in their home (cordless phones, Wi-Fi, etc.) were more effected than those who did not.

The sixty townspeople were asked about their health before and after the tower was turned on. There was a dramatic increase in subjective symptoms. The table below lists the number of complaints before and after the tower was activated.

Symptoms	Before	After
Sleep problems	11	19
Headache	2	10
Allergy	11	16
Dizziness	5	8
Concentration problems	10	14

Source:

Changes of clinically important neurotransmitters under the influence of modulated RF fields — a long-term study under real-life conditions, Buchner K., Eger H., Umwelt Medizin Gesellschaft, 2011, 24(1), 44-57.
www.avaate.org/IMG/pdf/Rimbach-Study-20112.pdf

The North Sydney Television Towers

This study looked at whether the radiation from a television transmitter could interfere with patients recovering from childhood leukemia.

Using a public health registry, 160 cases of childhood leukemia were identified in the study area. The researchers grouped the children according to the radiation level they were exposed to from the TV transmitters:

High: $0.2 - 8.0 \mu\text{W}/\text{cm}^2$
 Low: $0.02 - 0.2 \mu\text{W}/\text{cm}^2$

The study concludes that patients in the high exposure group were more likely not to recover.

We remind the reader that, according to the smart meter industry itself, smart meters radiate in the range of 0.1 to $2 \mu\text{W}/\text{cm}^2$.

Source:

Decreased Survival for Childhood Leukemia in Proximity to Television Towers, Bruce Hocking and Ian Gordon, Archives of Environmental Health, September 2003.

www.tandfonline.com/doi/abs/10.3200/AEOH.58.9.560-564?journalCode=vzeh20#preview

The study of Sutro Tower, San Francisco

Sutro Tower is a large transmission tower located on a hill on the west side of San Francisco. It was constructed in 1973 and has since been the site of television and radio transmitters for the San Francisco Bay area. Cancer clusters were investigated around 1988, and data from that time was used.

Measurements showed the radiation level on the nearest residential streets to be between 1 and 33 $\mu\text{W}/\text{cm}^2$. The levels decreased rapidly with further distance.

The report found that there was a clear correlation between the distance to Sutro Tower and incidents of childhood cancers. The levels of cancer first became normal at a distance of 6 km (3.7 miles). The radiation level at that distance was around 0.1–0.3 $\mu\text{W}/\text{cm}^2$. For comparison, the baseline smart meter radiation levels are from 0.1 to 2 $\mu\text{W}/\text{cm}^2$ for some people.

Source:

Childhood Cancer in the vicinity of the Sutro Tower, San Francisco, Neil Cherry, Lincoln University, NZ.

www.neilcherry.com/documents/90_r3_EMR_Sutro_Paper_09-02.pdf

The Bavarian study of young people

This is a large study of 1,498 children and 1,524 adolescents from four small towns in Bavaria, Germany. Each of the test subjects wore a radio-frequency radiation dosimeter for 24 hours.

The article does not state what the specific radiation levels were, just that they were far below the legal limits.

The report concludes that increasing RF radiation exposure also means increasing behavioral problems with both children and adolescents.

Source:

Exposure to radio-frequency electromagnetic fields and behavioural problems in Bavarian children and adolescents, Silke Thomas et al., European Journal of Epidemiology, December 2009.

<http://dx.doi.org/doi:10.1007/s10654-009-9408-x>

<http://link.springer.com/article/10.1007%2Fs10654-009-9408-x>

The French study

A health survey was conducted with 530 people, who were asked a series of health questions, such as whether they experienced fatigue, headaches, sleep disturbances, irritability and other symptoms that have been associated with exposure to microwave radiation. They were also asked about the distance to cell towers, television towers, transformers, as well as their use of telephone and computer.

The study found an association with the distance to cellular towers. People living closer than 100 meters (300 ft) had more symptoms than those within 200 meters (600 ft), and so on. The study recommends not siting cell towers within 300 meters (900 ft) of people's homes.

Source:

Study of the health of people living in the vicinity of mobile phone base stations: I. Influences of distance and sex (English translation), R. Santini et al., Pathol Biol 2002, 50: 369-373.

www.der-mast-muss-weg.de/pdf/recherche_aerzte/SantiniStudieEnglisch.pdf

Conclusion

Six epidemiological studies are presented, each studying health effects in populations living near transmitters of radio-frequency (RF) waves. Three studies focused on children.

All six studies found health effects associated with living near the towers, at exposure levels far below current FCC radiation limits. Examples of found health effects include breast cancer, brain cancer, leukemia, failure to recover from leukemia, abnormal levels of neurotransmitters in blood samples, as well as several subjective symptoms including headaches, sleep disturbances, irritability and fatigue.

Four of the studies reveal the exposure levels around which harm is found. These are similar to what people in their home can receive from a smart meter at a distance of 3 to 10 ft under normal circumstances. Under special circumstances, such as an apartment complex with multiple meters, a house or business with metallic surfaces, or a busy mesh meter, the radiation exposure can be higher.

Epidemiological studies are not theoretical lab-studies, but examine the effect on real people under real-life conditions. They are thus strong evidence that real harm is possible.

Submitted on behalf of
Safer Utilities Network
P.O. Box 1523
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Environmental Epidemiological Study of Cancer Incidence in the Municipalities of Hausmannstätten & Vasoldsberg (Austria)



English Executive Summary

Translation by Katharina Gustavs

Source: <http://www.verwaltung.steiermark.at/cms/ziel/21212/DE/>

Dr. Gerd Oberfeld

Environmental Epidemiological Study
of Cancer Incidence in the Municipalities of
Hausmannstätten & Vasoldsberg (Austria)

Commissioned by
Provincial Government of Styria,
Department 8B, Provincial Public Health Office, Graz (Austria)

Conducted by
Dr. Gerd Oberfeld, Salzburg (Austria)

20 January 2008

Executive Summary

It was the study's objective to determine whether cancer cases that became known in the eastern part of Hausmannstätten or Vasoldsberg, respectively, represent a cluster with regard to timing and location as well as whether they might be associated with the mobile phone base station, which operated as a car phone service from 1984 to 1997. The analog mobile phone base station under study was part of the national C-Network, installed by the Austrian post and communications authority and operated according to the Nordic Mobile Telephone 450 (NMT 450) standard. The cell radii of this network were usually up to 30 km.

The area under study was defined as a circle with a 1,200-m radius around the former transmitter. With the help of the provincial government of Styria (GIS Steiermark) and the municipalities of Hausmannstätten and Vasoldsberg, n=2,543 potential study participants could be located and personally invited to participate in the study. By applying limiting exposure conditions such as the assumption of a latency period, an "after-effect period" and a 5-year minimum exposure period, three different case-control samples were compiled. Sample A (67 cases/1242 controls) and B (67 cases/646 controls) included living and deceased cases, sample C (28 cases/56 controls) living cases only.

Based on the selected exposure period limits, the distance assessment for the range from 0 to 200 m around the transmitter in comparison to the area from 201 to 1,200 m showed a significantly increased cancer risk for all three samples, which makes for a distinct incidence with regard to location. The incidence was particularly pronounced for breast and brain tumors.

The exposure assessment with regard to the analog transmitter (NMT450) was conducted on an individual basis for all three samples (A, B, C), using calculations based on NIRView and CORLA software products. Taking into account the antenna characteristics, natural terrain and built environment, the transmitter input power was based on 25 watts for a continuously

transmitting calling channel. The respective power density level was determined for a total of 1,309 individuals.

It was a question whether to determine the exposure level of a continuously transmitting calling channel only or the calling channel plus (probably) three traffic channels. From a precautionary point of view, the exclusive consideration of the calling channel is desirable, which was done in this assessment.

Furthermore, 25 m to the east of the original transmitter site (NMT450), a simulated transmitter was installed with the same antenna height (8 m above ground) and the actively transmitting test signal (434.2 MHz) was measured at the selected frequency in the bedrooms of 84 study participants (sample C only). In addition, participants of this sample also answered an extensive questionnaire on cancer risk factors and protective factors in a personal interview. The analysis of this data revealed that these factors could not explain the local incidence we found or the relationship with the RF radiation exposure.

The essential assessment focused on the relationships between the RF radiation exposure levels from the transmitter and cancer risk. The risk (odds ratio=OR) was assessed for the exposure categories 10-100 $\mu\text{W}/\text{m}^2$, 100-1000 $\mu\text{W}/\text{m}^2$ and greater than 1000 $\mu\text{W}/\text{m}^2$ (1 mW/m^2) in relation to the reference category less than 10 $\mu\text{W}/\text{m}^2$, all of which apply to outdoor levels.

For all models, the analysis revealed significantly increased risk ratios. Compared to the reference category (<10 $\mu\text{W}/\text{m}^2$), the cancer risk for all cancer sites in the highest exposure category (>1000 $\mu\text{W}/\text{m}^2$) was 5 to 8 times higher, depending on the sample. Similar to the distance assessment, the cancer cases were again most pronounced for the cancer sites breast and brain.

In comparison to the reference category ($<10 \mu\text{W}/\text{m}^2$), the cancer risk in the highest exposure category ($>1000 \mu\text{W}/\text{m}^2$) of sample A was 23 times higher for breast cancer and 121 times higher for brain tumors. For all three endpoints under study (all sites, breast, brain) significant exposure-effect relationships (p for the trend) were observed.

Detailed results for sample A are summarized in the chapter below, called "Summary of the Risk Calculations for Sample A". With its higher number of controls, sample A has an advantage over sample B because its statistical power is slightly higher. In addition, sample-A participants are taken mainly from the registry and therefore rather independent of their willingness to participate.

In summary, based on the selected exposure period limits, the study showed a significant cancer incidence with regard to timing and location in the area around the transmitter as well as significant exposure-effect relationships between RF radiation exposure and the incidence of breast cancers and brain tumors.

This case-control study is the first worldwide to investigate the relationship between cancer risk and a mobile phone base station by means of a special calculation software as well as historically simulated measurements. For various reasons, the study of NMT base stations makes sense. For example, the antenna characteristics are adequately known. Generally speaking, all that is required to simulate exposure levels is information about the site and the antenna height. Furthermore, in the exposure time period from 1984 to 1997, RF radiation exposures were still rather straightforward, a fact that makes the research on health impacts from these new technologies increasingly more difficult.

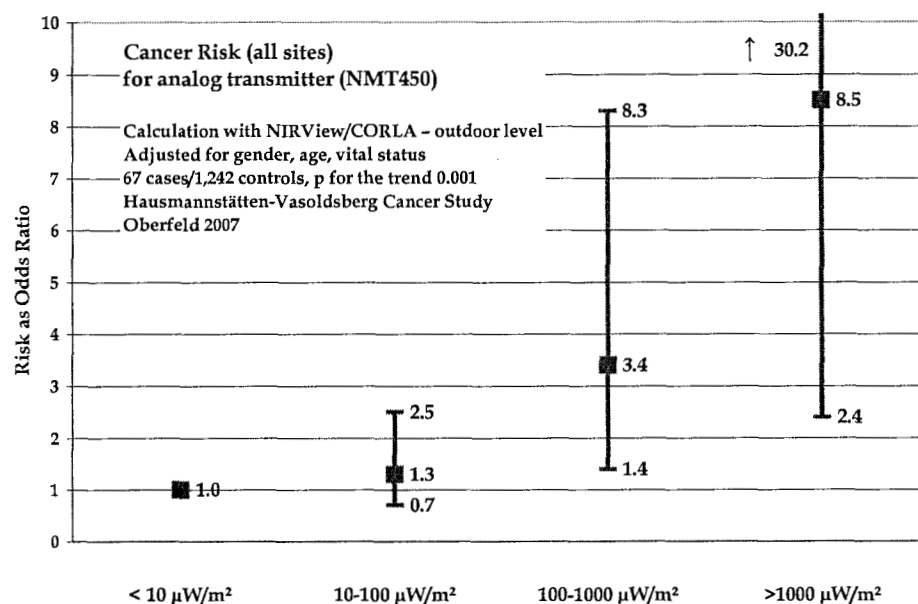
Summary of Risk Calculations for Sample A

In the tables and graphs below, the results of the multivariate risk calculations for sample A adjusted for age, gender and vital status can be found.

All Cancer Sites

Exposure (outdoor)	Controls	Cases	OR	95 % CI	p-value	p-trend
<10 $\mu\text{W}/\text{m}^2$	837	39	1.0	-	-	0.001
10-100 $\mu\text{W}/\text{m}^2$	313	17	1.3	0.7-2.5	0.454	
100-1000 $\mu\text{W}/\text{m}^2$	76	7	3.4	1.4-8.3	0.008	
>1000 $\mu\text{W}/\text{m}^2$	16	4	8.5	2.4-30.2	0.001	

Table 1: Sample A – All Cancer Sites: Results of logistic regression for exposure variables (exposure calculation - outdoor) adjusted for age, gender and vital status. Exposure-effect relationship

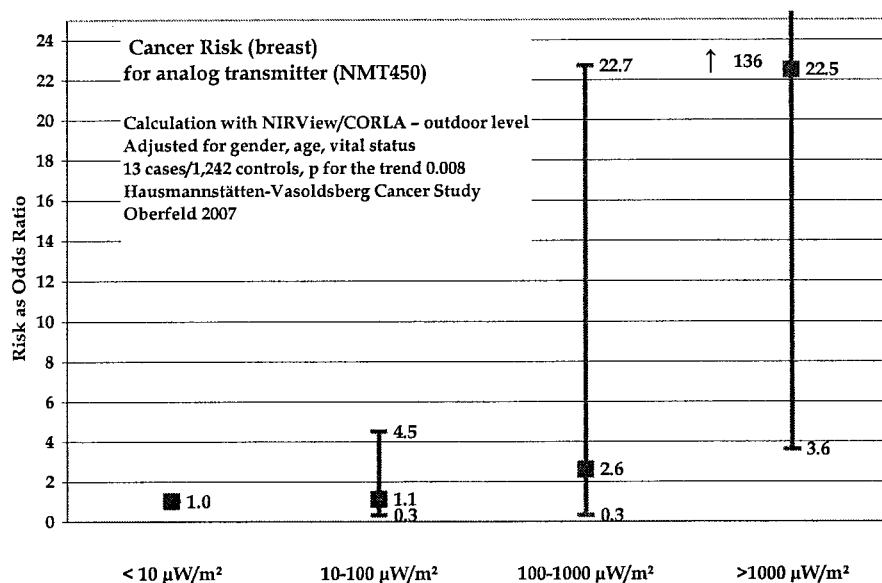


Graph 1: Sample A – All Cancer Sites: Results of logistic regression for exposure variables (exposure calculation - outdoor) adjusted for age, gender and vital status. Exposure-effect relationship

Cancer Site: Breast

Exposure (outdoor)	Controls	Cases	OR	95 % CI	p-value	p-trend
<10 $\mu\text{W}/\text{m}^2$	837	7	1.0	-	-	0.008
10-100 $\mu\text{W}/\text{m}^2$	313	3	1.1	0.3-4.5	0.881	
100-1000 $\mu\text{W}/\text{m}^2$	76	1	2.6	0.3-22.7	0.394	
>1000 $\mu\text{W}/\text{m}^2$	16	2	22.5	3.6-136.6	0.0007	

Table 2: Sample A – Cancer Site Breast: Results of logistic regression for exposure variables (exposure calculation - outdoor) adjusted for age, gender and vital status. Exposure-effect relationship

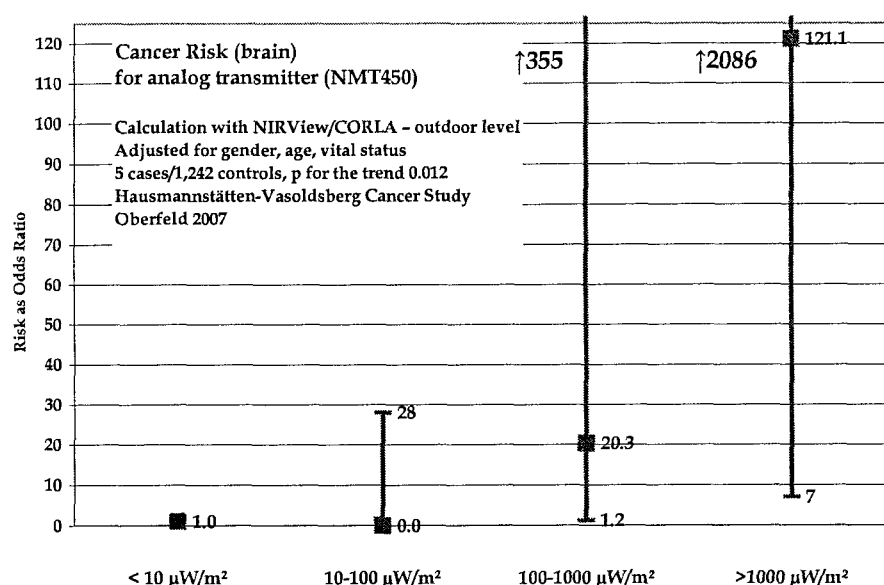


Graph 2: Sample A – Cancer Site Breast: Results of logistic regression for exposure variables (exposure calculation - outdoor) adjusted for age, gender and vital status. Exposure-effect relationship

Cancer Site: Brain

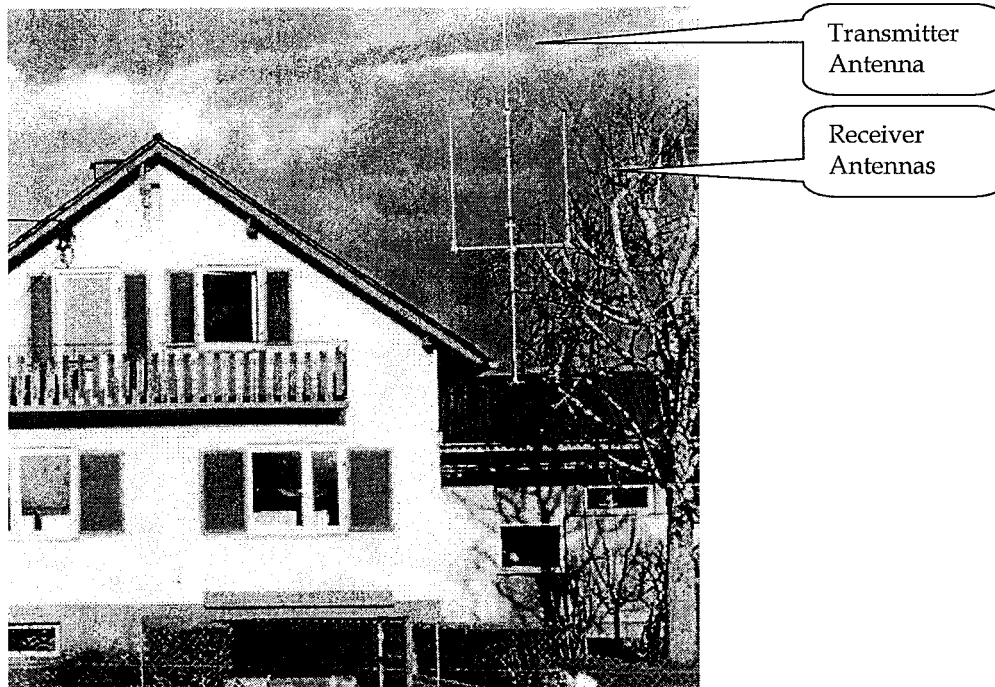
Exposure (outdoor)	Controls	Cases	OR	95 % CI	p-Wert	p-trend
<10 $\mu\text{W}/\text{m}^2$	837	1	1.0	-	-	0.012
10-100 $\mu\text{W}/\text{m}^2$	313	0	0.0	0.0-2E+28	0.867	
100-1000 $\mu\text{W}/\text{m}^2$	76	2	20.3	1.2-355.2	0.039	
>1000 $\mu\text{W}/\text{m}^2$	16	2	121.1	7.0-2086.0	0.001	

Table 3: Sample A – Cancer Site Brain: Results of the logistic regression for exposure variables (exposure calculation - outdoor) adjusted for age, gender and vital status. Exposure-effect relationship

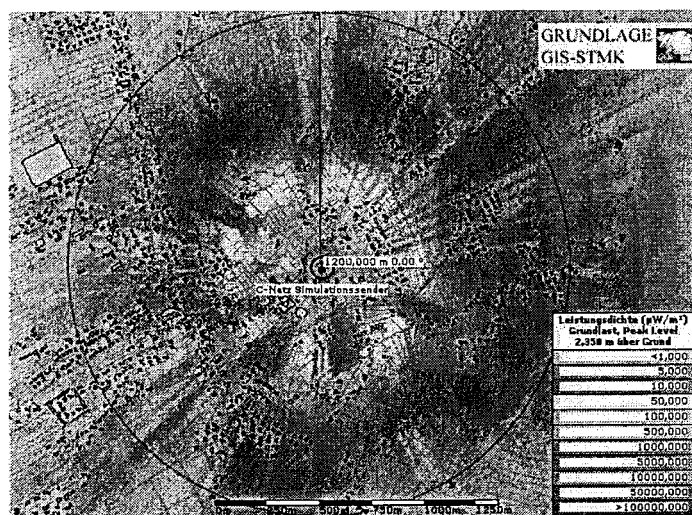


Graph 3: Sample A – Cancer Site Brain: Results of logistic regression for exposure variables (exposure calculation - outdoor) adjusted for age, gender and vital status. Exposure-effect relationship

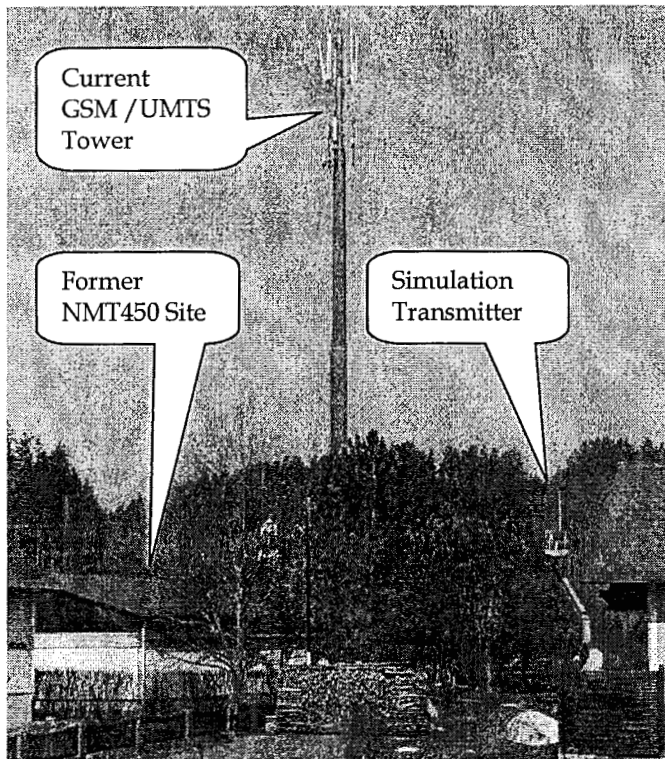
Illustrations



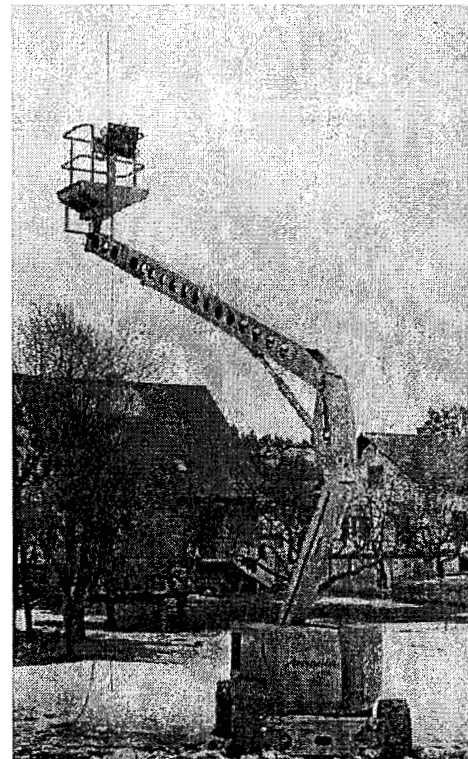
Right Side of the Picture: Telephone Exchange Center with C-Network Transceiver (NMT 450), 8071 Hausmannstätten, Property No. 865, KG Hausmannstätten, 1994. Source: W. Sabutsch.



Immission Calculation – CORLA (Building Model) for C-Network Transmitter at the 2.35-m Layer above Ground, data basis GIS-STMK.



General View of Former Roof Site of NMT450 (C-Network) Telephone Exchange Center, Site of Simulated C-Network Transmitter and Current Mobile Phone Tower GSM/UMTS, March 2006



Simulated C-Network Transmitter Installed at Mobile Stacking Truck, March 2006

Changes of Clinically Important Neurotransmitters under the Influence of Modulated RF Fields—A Long-term Study under Real-life Conditions

Klaus Buchner and Horst Eger

This follow-up of 60 participants over one and a half years shows a significant effect on the adrenergic system after the installation of a new cell phone base station in the village of Rimbach (Bavaria).

After the activation of the GSM base station, the levels of the stress hormones adrenaline and noradrenaline increased significantly during the first six months; the levels of the precursor dopamine decreased substantially. The initial levels were not restored even after one and a half years. As an indicator of the dysregulated chronic imbalance of the stress system, the phenylethylamine (PEA) levels dropped significantly until the end of the study period.

The effects showed a dose-response relationship and occurred well below current limits for technical RF radiation exposures. Chronic dysregulation of the catecholamine system has great relevance for health and is well known to damage human health in the long run.

Keywords: cell phone base station, long-term study, stress hormones, radiofrequency radiation, GSM transmitter, far-field radiation

Decreased Survival for Childhood Leukemia in Proximity to Television Towers

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ABSTRACT. Previously, an increased risk of childhood leukemia was identified among children who resided in an inner ring (radius ~4 km) of 3 municipalities surrounding television towers, compared with children who resided in an outer ring (radius ~4–12 km) of 6 municipalities surrounding, but farther away from, the towers, which are situated in North Sydney, Australia. In the current study, the authors examined the survival experience of these children for all childhood leukemias, and for acute lymphatic leukemia (*International Statistical Classification of Diseases and Related Health Problems*, 9th revision [ICD-9] rubric 204.0) in particular. Of 123 cases of acute lymphatic leukemia, 29 cases (16 of whom died) were in the inner ring of municipalities nearest the towers, and 94 cases (34 of whom died) occurred in the outer, more-distant ring. There was a significant difference in survival rates between the 2 groups (log-rank test, $p = 0.03$; Wilcoxon, $p = 0.05$). The 5-yr survival in the inner ring of municipalities was 55%, and in the outer ring was 71% (i.e., subjects in the inner ring were 23% less likely to survive than those in the outer ring); at 10 yr, survival in the inner and outer rings was 33% and 62%, respectively. Following adjustment, the mortality rate ratio that the authors used to compare the inner ring with the outer ring was 2.1 (95% confidence interval = 1.1, 4.0). There was an association between residential proximity to the television towers and decreased survival among cases of childhood leukemia in North Sydney, Australia.

<Key words: Australia, childhood cancer, leukemia, radiofrequency radiation, survival>

Childhood Cancer in the vicinity of the Sutro Tower, San Francisco.

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19th September 2002

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*** Associate Professor N.Z. = Full Professor U.S.**

O.N.Z.M: Royal honour: Officer of the New Zealand Order of Merit

Exposure to radio-frequency electromagnetic fields and behavioural problems in Bavarian children and adolescents

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Abstract Only few studies have so far investigated possible health effects of radio-frequency electromagnetic fields (RF EMF) in children and adolescents, although experts discuss a potential higher vulnerability to such fields. We aimed to investigate a possible association between measured exposure to RF EMF fields and behavioural problems in children and adolescents. 1,498 children and 1,524 adolescents were randomly selected from the population registries of four Bavarian (South of Germany) cities. During an Interview data on participants' mental health, socio-demographic characteristics and potential confounders were collected. Mental health behaviour was assessed using the German version of the Strengths and Difficulties Questionnaire (SDQ). Using a personal dosimeter, we obtained radio-frequency EMF exposure profiles over 24 h. Exposure levels over waking hours were expressed as mean percentage of the reference level. Overall, exposure to radiofrequency electromagnetic fields was far below the reference level. Seven percent of the children and 5% of the adolescents showed an abnormal mental behaviour. In the multiple logistic regression analyses measured exposure to RF fields in the highest quartile was associated to overall behavioural problems for adolescents (OR 2.2; 95% CI 1.1–4.5) but not for children (1.3; 0.7–2.6). These results are mainly driven by one

subscale, as the results showed an association between exposure and conduct problems for adolescents (3.7; 1.6–8.4) and children (2.9; 1.4–5.9). As this is one of the first studies that investigated an association between exposure to mobile telecommunication networks and mental health behaviour more studies using personal dosimetry are warranted to confirm these findings.

Keywords Behavioural problems · Radio-frequency electromagnetic fields · Children · Adolescents · SDQ · Dosimetry

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(English translation)

Study of the health of people living in the vicinity of mobile phone base stations: I. Influences of distance and sex *

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Summary

A survey study using a questionnaire was conducted on 530 people (270 men, 260 women) living or not in the vicinity of cellular phone base stations, on 18 Non Specific Health Symptoms. Comparisons of complaint frequencies (CHI-SQUARE test with Yates correction) in relation to the distance from base stations and sex show significant ($p < 0.05$) increase as compared to people living > 300 m or not exposed to base stations, up through 300 m for tiredness, 200 m for headache, sleep disruption, discomfort, etc., 100 m for irritability, depression, loss of memory, dizziness, libido decrease, etc. Women significantly more often than men ($p < 0.05$) complained of headache, nausea, loss of appetite, sleep disruption, depression, discomfort and visual disruptions. This first study on symptoms experienced by people living in the vicinity of base stations shows that, in view of radioprotection, the of minimal distance of people from cellular phone base stations should not be < 300 m. © 2002 Editions scientifiques et medicales Elsevier SAS

base station / bioeffects / cellular phone